and showed marks of putrescence, the light seemed to be more quickly extinguished. In some instances the light was ejected in globules, like quicksilver when rubbed with any unctuous substance, and afterwards adhered to the sides of the vessel in the form of a lucid ring. The serum both of healthy and diseased persons retained the luminous appearance somewhat longer than the crassamentum, and frequently recovered it when agitated. Urine, both fresh and stale, and bile, showed little disposition to retain this light. Lastly, milk and cream, illuminated by mackerel light, acquired great brightness, and retained it for upwards of twenty-four hours; but when either of these turned sour, they contracted a very extinguishing property, the light in some case vanishing almost instantaneously.

Account of a Series of Experiments, undertaken with the view of decomposing the Muriatic Acid. By Mr. William Henry. *Communicated by the Right Hon. Sir* Joseph Banks, *Bart. P.R.S.* Read Feb. 27, 1800. [*Phil. Trans.* 1800, *p.* 188.]

In the introduction to this paper the author points out the great utility that would accrue to chemical science, were it possible to arrive at a complete analysis of certain acids, since the new, and indeed every system of chemistry, will ever be incomplete and liable to subversion till the particular agents here alluded to have been resolved into their constituent principles. The obstacles, however, which impede the progress of this investigation, are much greater than may appear at first sight; and among these are particularly mentioned the difficulty of obtaining the acids completely separated from all other substances, which, by their presence, will ever tend to introduce uncertainty into the results of the process; it being observed that the attraction between compound particles at all times increases in proportion as we recede from the point of saturation, and that the smallest remnant is often sufficient to perplex all further analysis. The liquid state is thought to be totally unfit for the purpose of this inquiry: and after some other strictures, it is shown that the state of the gas is the only one in which acids can become proper objects of analytical investigation.

In the series of his experiments on the muriatic acid in the gaseous state, Mr. Henry employed the electric fluid as an agent much preferable to artificial heat. "This mode of operating," he says, "enables us to confine accurately the gases submitted to experiment; the phænomena that occur during the process may be distinctly observed, and the comparison of the products with the original gases may be instituted with great exactness." The action of the electric fluid itself, as a decomponent, is no doubt extremely powerful; since it is capable of separating from each other the constituent parts of water, of the nitric and sulphuric acids, of the vegetable alkali, of nitrous gas, and of several other bodies whose components are known to be strongly united. The experiments were

made in straight glass tubes of various diameters, armed at the sealed end with a metallic conductor, through which the shocks were introduced, the gas being at the other end confined by quicksilver.

The experiments, eighteen in number, are arranged under two heads, the first of which relates to the effects of electricity on muriatic gas, either pure or with the admixture of common air and oxygenous gas; and in the second are recorded the effects of electrifying the muriatic acid gas with inflammable substances.

The results of these experiments, which in the first set were generally a diminution, and in the second an expansion of the aerial fluid within certain limits, plainly evinced that no decomposition whatever of the muriatic acid had ever been effected, the residue always exhibiting the characters of hydrogenous or carbonic gases, whence it was reasonable to infer that with all the precautions that were used, the muriatic gas had never been perfectly freed from some admixture of water or other ingredient.

The following general conclusions are deduced from these results.

1) The muriatic acid gas, in the driest state in which it can be produced, still contains a portion of water. The most decisive of the experiments indicating a proportion of 1·4 grain of water to 100 cubical inches of muriatic gas, long exposed to a sufficient quantity of muriatic lime.

2) When electrical shocks are passed through this gas, the watery portion is decomposed; the hydrogen of the water which unites with the electric matter, constituting hydrogenous gas; and the oxygen which combines with the muriatic acid which at the same time acts on the quicksilver, composing muriate of mercury.

3) The electric fluid serves as an intermediate agent in combining oxygen with muriatic acid; while the really acid portion of the muriatic gas does not sustain any decomposition by the action of electricity.

4) When electric shocks are passed through a mixture of carbonated hydrogen and muriatic acid gases, the water held in solution by these gases is decomposed by the carbon of the compound inflammable gas, and carbonic acid and hydrogenous gases are the result.

5) When all the water of the two gases has been decomposed, no effect ensues from continuing the electrization.

6) And lastly, since carbon, though placed under the most favourable circumstances for being separated from the muriatic acid, and combining with its oxygen, evinces no such tendency, it may be inferred, that if the muriatic acid be an oxygenated substance, its radical has a stronger affinity to oxygen than is possessed by charcoal.

Although this investigation have proved unsuccessful as to the particular object for which it was instituted, the author however thinks the communication of it cannot but be productive of some utility; since, besides some material facts it has brought to light, it may prevent others from engaging in most laborious processes of a similar nature, being thus cautioned against the fallacy of their results. All

hope, he apprehends, must be relinquished of ever effecting the decomposition of the muriatic acid in the way of simple elective attraction; its basis being probably some unknown body, which nothing but the application of complicated affinities will perhaps ever enable us to discriminate.

On double Images caused by atmospherical Refraction. By William Hyde Wollaston, *M.D. F.R.S.* Read March 6, 1800. [*Phil. Trans.* 1800, *p.* 239.]

The remarkable instances of double and triple images of the same object produced by aerial refraction near the horizon, lately communicated to the Society by Mr. Huddart, Prof. Vince, and Mr. Dalby, have given rise to the present paper, in which the author attempts to explain these phænomena on theoretical principles, and to illustrate his conclusions by artificial experiments.

Admitting the inference given by Professor Vince, that these appearances arise from certain *unusual variations* of increasing density in the lower strata of the atmosphere, our author undertakes, 1st, to investigate the successive variations of increasing or decreasing density to which fluids in general are liable, and the laws of the refractions occasioned by them; 2dly, to illustrate and confirm the truth of this theory by experiments with fluids of known densities; and lastly, to ascertain, by trial upon the air itself, the causes and extent of those variations of its refractive density on which the inversions of objects and other circumstances observed in the above phænomena seem to depend.

Under the first head we find the demonstrations of three propositions, deduced from the general laws of refraction. The first imports, that if the density of any medium varies by parallel, indefinitely thin strata, a ray of light moving through it in the direction of the strata, will be made to deviate during its passage; and the deviation will ever be proportionate to the increment of density where it passes. From the second it appears, that when two fluids of unequal densities are brought into contact, and unite by mutual penetration, if the densities at different heights be expressed by ordinates to a perpendicular line drawn across the fluids, the curve drawn through the terminations of these ordinates will have a point of contrary flexure. And in the third proposition it is shown, that if parallel rays pass through a medium, varying according to the preceding proposition, those rays above the point of contrary flexure, where the line will be concave, will be made to diverge, while those below the same point, where the curve will be convex, will converge after their passage through it. The converging rays, it follows hence, will at a certain distance, proportionate to the quantity of convergency, meet in a focus, beyond which they will diverge again, and thus produce effects perfectly similar to those caused by a medium of uniform density, having a surface similar to the above-mentioned curve of densities, whether convex or concave, according to the nature of that curvature. Hence may be inferred